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ABSTRACT

This paper examines the effects of gender and test anxiety on students' achievement, cognition, and affects, with an interest in exploring why some students are less likely to benefit from classroom instruction than others. The data came from a western Canadian university study of 424 undergraduate students. Correlational and univariate statistics were used to examine the relationships among variables. Results indicated that gender and test anxiety differentially influenced student learning and learning-related outcomes. Low test anxious males showed higher achievement outcomes, perceived more success over their performances, and felt more confident than high test- anxious males or females. The results extend previous research and are discussed in terms of their practical applications for college teaching. (Contains 4 figures, 3 tables, and 43 references.) (Author/SLD)

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Abstract

This paper examines the effects of gender and test anxiety on students achievement, cognition, and affects. The data came from a Western Canadian University study of 424 undergraduate students. Correlational and univariate statistics were used to examine the relationships among variables. Results indicated that gender and test anxiety differentially influence student learning and learning related outcomes. The results extend previous research and are discussed in terms of their practical implications for college teaching.

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Academic Success in College: An Empirical Investigation of Gender Differences by Test Anxiety Interaction

The purpose of the present study was to extend previous research on gender differences and test anxiety on college students' achievement, cognition, and affects. More specifically, the focus was to explore why certain students are less likely to benefit from classroom instruction than others. Individual differences manifested by students in the college classroom present a major challenge for educators, particularly characteristics that place students at-risk academically (McKeachie, Pintrich, Lin, & Smith, 1986). The exploration of such phenomenon addresses some of the questions educators have concerning the improvement of students' learning experience in the college classroom. Of critical interest to the present study was the interaction between test anxiety and gender on student learning related outcomes.

Test Anxiety

Given that most college learning experiences involve the evaluative process, an investigation considering test anxiety was of interest. Anxiety is the emotion of avoidance to perceived but largely unrealistic threats or dangers (Plutchik, 1980). It involves a state of arousal that occurs as a result of perceiving a lack of power to handle some threatening situation. One of its most pronounced forms in the college setting is test anxiety, a situational-specific form of trait anxiety (Spielberger, 1972). It refers to individual differences in anxiety proneness in evaluative situations. For example, high test-anxious students are more likely to experience (a) emotional reactions characterized by feelings of tension, apprehension, and nervousness; (b) self-centered worry cognition that interferes with attention; and (c) activation or arousal of the autonomic nervous system (Spielberger, Gonzalez, & Fletcher, 1979). In short, test anxiety is a pattern of intense and substantial emotional, cognitive, and physiological activation that has earned the reputation of being one of the most pervasive problems associated with student learning in institutions of higher education.

Research focusing on college student differences has demonstrated that anxiety distinguishes less adaptive from adaptive learning. Since the late 1950's, educational researchers have reported scholastic performance decrements among high as compared to low test-anxious students exposed to evaluative situations (Arkin, Detchon, & Maruyama, 1982; Sarason, 1959; Spielberger, Anton, & Bedell, 1976; Tobias, 1985). High versus low test-anxious students display less adaptive study habits (Wittmaier, 1972) such as spending less time studying (Allen, Lerner, & Hinrichsen, 1972), are more prone to procrastination of study and homework behaviors (Rothblum, Solomon, & Murakami, 1986), and demonstrate lower levels of high school GPAs (Prociuk & Breen, 1973). High as compared to low test-anxious students, tend to report more negative thoughts involving the self (Blankstein, Flett, Boase, & Toner, 1990), and diminished levels of personal control and lack of confidence in problem-solving situations (Blankstein, Flett, & Batten, 1989). Thus, high in comparison to low test anxiety, is related to poorer achievement outcomes.

Gender Differences

Differences in test anxiety have also been reflected by differences in gender. For instance, females in comparison to males, self-reported higher levels of test anxiety (Rothblum, Solomon, & Murakami, 1986) and showed higher recollections of test-anxious academic situations (DeVito, 1984). Hembree's (1988) meta-analysis of 562 test anxiety studies demonstrates that females are consistently more test-anxious than males. However, these differences do not reflect differences in academic performance (Hembree, 1988). Zoller and Ben-Chaim (1988) speculate that these findings may be due to the underrepresentation of females in a number of university classes. As a result of being a minority in the classroom, the need to succeed may be so great for females that it generated higher levels of test-anxiety in comparison to males (Deboer, 1985). Although these findings are somewhat informative to educational researchers and practitioners, many studies of test anxiety or gender differences

have been limited by their failure to consider the interaction of these two student differences. Furthermore, their focus is often limited to student learning outcomes. In an attempt to address these shortfalls, the present study focused on the Test Anxiety (low, high) by Gender (male, female) interaction for student achievement, cognition, and affect.

The Present Study

Instructors are exposed to students with diverse differences (see Figure 1). Low and moderate test-anxious students, regardless of their gender, were hypothesized to benefit from classroom instruction because of the adaptive learning orientations thought to be associated with their lower levels of test anxiety. High test-anxious students were postulated to enter the learning environment with a less adaptive learning orientation, and thus, not benefit from the facilitative effects of classroom instruction. As an extension of previous research, students' cognition and affects were also investigated.

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Insert Figure 1 about here

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Method

Subjects

A total of 424 students from a multisection introductory psychology course (approximately 3200) at the University of Manitoba volunteered for this study (experimental group: 104 male & 171 female; ages: 18 - 45; M = 20.87; SD = 4.65; control group: 139 students ages: 18 - 45; M = 22.22 SD = 6.39).

Material

Instructional manipulation. A female economics professor who had won a number of teaching awards gave a lecture on the topic of "demand", a lecture typically presented to first year economics students. A taped lecture rather than a "live" presentation was selected for a number of reasons. First, in order to investigate the causal nature of specific teaching behaviors, it was necessary to control for lecture content and presentation variables across all conditions, a task that is easily accomplished through videotaping. Second, comparable effectiveness in demonstrating teaching effects in college classrooms has been maintained through the use of videotapes (Perry, 1991). Third, videotaped instruction serves as an effective alternative to conventional instruction (Jamison, Suppes, & Wells, 1974).

An Electrohome Color Videotape Projection Unit projected the videotapes onto a 2.2 meter diagonal screen in order to simulate a life-size presentation. Furthermore, the videotape-camera focused on the lecturer at all times during the initial recording session, with the exception of an occasional view of the overhead material. Projection of this format of videotape recording onto a flat screen produces the illusion that the instructor is at all times facing the audience, regardless of the angle of vision that each student's seat represented. In order to enhance the visual effect, students were seated facing the screen within 50 degrees on either side of the perpendicular from the screen. This was done in order to reproduce as close to "life" representation of the lecturer as possible.

Classroom analog. The simulated college classroom setting was intended to provide a realistic environment in which to study student differences on student learning outcomes. Behavioral, affective, and cognitive involvement is generally quite high. According to Perry (1991), participants are often highly motivated to provide explanations for the outcome of the achievement event in a classroom analog.

The **Test Anxiety Scale** (Sarason, 1975) has been widely used as a measure of test anxiety in college settings. It has been used as an independent variable, where groups

representing extreme scores have been compared in examination situations (Tobias, 1985). Test-retest reliabilities tend to be over .80 on intervals of several weeks. For instance, Wagaman, Cormier, & Cormier (1975) have shown test-retest reliability coefficients of .87. The Test Anxiety Scale has also been used as a dependent variable in testing various clinical treatments of test anxiety reduction (Crocker & Schmitt, 1987; Decker, 1987).

The test anxiety scores were dichotomized to provide approximately equal groups of students. Students were categorized as low or high test-anxious according to a median split (range = 2 to 35). Students scoring 20 or less were classified as low (n = 131), whereas scores of 21 or more were defined as high test-anxious (n = 143). These delineations were used to ensure a suitable definition of test anxiety while maintaining acceptable sample sizes.

Lecture achievement test. Most studies have relied almost exclusively on student final examinations as outcome measures (see Murray, 1991). According to McKeachie et al. (1986), final examinations can be poor criteria for differentiating the effects of teaching since they are based primarily on textbook material and therefore poor indicators of learning derived solely from the lecture presentation. Moreover, students may try to compensate for ineffective teaching by additional research or getting help from peers, thereby confounding any teaching effect. In order to avoid this problem, an empirical investigation of teaching behaviors in a controlled environment was conducted where the criteria for learning was the amount of information learned from novel lecture material and not from external sources such as textbooks or peers. Students were exposed to a "one-time" lecture presentation and were then required to write the achievement test. In order to ensure that the material presented was novel, students were screened regarding their experience with the lecture material. Few studies have sought to control students' prior knowledge of content material presented in the lecture manipulation. Two methods were utilized to address this issue here. First, introductory psychology students were exposed to lecture content not directly related to their discipline--an economics lecture. Second, in order to control for prior knowledge effects, students who self-reported economics experience were deleted from the initial sample, i.e., "Have you ever had this material before?": "Yes" or "No".

Of the initial 424 subjects, 139 identified having had previous exposure to the lecture material. Prior to removing these subjects, which might result in a unique subsample of remaining students and therefore make generalization a potential problem, student differences were examined. A Previous Exposure (no, yes) one-way ANOVA was conducted on a number of student difference variables. No significant effects were demonstrated on Test Anxiety or Age. However, significant main effects were found for achievement score, $F(1, 432) = 71.76$, $MS_e = 26.75$, $p < .0001$, and for the importance to do well $F(1, 427) = 5.66$, $MS_e = 5.73$, $p < .01$, suggesting that economics-experienced students performed much better (M = 20.28; SD = 5.48; n = 139 vs. M = 15.77; SD = 5.02; n = 295) and felt that it was more important to do well than their counterparts (M = 5.50; SD = 2.49; n = 133 vs. M = 4.90; SD = 2.35; n = 295). Since the purpose of the study was to examine the effects of gender difference and test anxiety on novel lecture material, these "economics-experienced" subjects were removed from further analyses. Obviously, this presents certain limitations for the generalizability of the results.

The achievement test derived from the lecture was composed of 30 multiple-choice items, each item having four choices. Ten items represented recognition, whereas the other items measured knowledge application. The multiple-choice test was designed to be moderately difficult in order to avoid a ceiling affect (M = 15.77; SD = 5.02; range = 4 - 29). Students perceived the test as difficult. For instance, on a 10-point scale (i.e., 1 = "no influence on my performance"; 10 = " a great deal of influence on my performance"), they attributed test difficulty as having an influence on their performance (M = 6.37; SD = 2.33; n = 285).

Post-achievement test questionnaire. In order to investigate the impact of gender and test anxiety on student perceptions of success and control, and affect, a post-achievement test questionnaire was administered. Each of these items were rated on a ten-point scale. First, students rated how much success and control they had over their performance (i.e., 1 = "very little"; 10 = "very much"). Next, students rated the extent to which they experienced confidence (i.e., 1 = "helpless"; 10 = "confident").

Procedure

Participants, in groups of 40-50, completed a set of questionnaires which probed for Gender, Age, and Test Anxiety. Following the questionnaire, students were exposed to a 25-min. economics lecture color videotape. A lecture achievement test was administered to assess retention and conceptual understanding of the lecture. Finally, a post-lecture questionnaire was given. In order to ensure an educational learning experience, all students were debriefed.

Results

Four dependent variables were analyzed in order to explore the combined effects of gender and test anxiety on student learning and learning related outcomes. They included lecture achievement, perceived success and control, and affect defined by confidence. The correlation matrix is displayed in Table 1. First, gender is negatively correlated to test anxiety, but positively to perceived amount that students learned, suggesting that female students are more test anxious, but perceive to have learned more than males. Second, test anxiety is negatively associated with lecture achievement, perceptions of success and control, and pride. Third, students performing well on lecture achievement and those who perceived to have learned lots also tend to have higher levels of perceived success and control. Fourth, perceived success is positively correlated to perceived control and helplessness-confidence affect. These findings suggest that as students' levels of success are increased, their affects become more positive. Finally, students with high perceptions of control tend to have stronger feelings of confidence. Thus, a number of factors are related to student learning and learning related outcomes.

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In order to understand the causal connections of these correlations, the univariate relationships were examined. Means and standard deviations are displayed in Table 2. Gender (female, male) by Test Anxiety (low, high) 2 x 2 ANOVAs demonstrated a number of significant main effects and interactions. As shown in Table 3, high as compared to low, test anxious students performed poorly, perceived less success and control, and felt more helpless. Females demonstrated lower achievement scores than males.

Interactions listed in Table 3, were further probed with Bonferroni t tests (alpha = .05; t = 2.82). A consistent pattern of results was demonstrated on the dependent measures. Low test-anxious males demonstrated higher achievement outcomes, $t(274)$ = 3.26, 3.87 (see Figure 2), perceived more success, $t(274)$ = 3.77, 3.78 (see Figure 3), and felt more confident, $t(274)$ = 3.97, 3.32 (see Figure 4), than either male or female high test-anxious students. Low test-anxious males also demonstrated higher achievement, $t(274)$ = 3.68 (see Figure 2) and confidence scores than low test-anxious females, $t(274)$ = 2.82 (see Figure 4).

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Discussion

Student differences, as defined by gender and test anxiety, have important implications for student achievement and achievement related outcomes. First, each of these student difference variables impacts student learning. Second, the interaction between gender and test anxiety also influences scholastic outcomes of students.

Gender

The present study supports Hembree's (1988) meta-analysis, in that females are more test-anxious than males. It is difficult to attribute these differences to any aspect of the experiment, such as the economics lecture or test, given that all subjects completed the test-anxiety survey prior to any knowledge about the nature of the experiment. Therefore, students will have had to come to the experiment with differences in test anxiety, females demonstrating higher levels than their male counterparts.

Females, in comparison to males, tend to be much more open about their current feelings (Shields, 1991). Furthermore, in order to protect their self-esteem, males may have distorted their feelings of anxiety. The fact that test anxiety was not significantly correlated with achievement may indicate this discrepancy in self-reporting of test anxiety. Of interest is the fact that students' perception of amount learned was inversely correlated with test anxiety. In other words, students who reported themselves as highly test anxious, in particular females, perceived as having done much poorer than those who provided low test-anxious self-reports, in particular, males. Although speculative, it is possible that differences in test anxiety may be a result of differences in self-disclosure. More research is needed to uncover the specifics of gender differences in self-disclosure of levels of test anxiety.

Females also demonstrated lower achievement scores than males. A number of explanations are proposed. First, the fact that a female instructor presented the material may have impacted each gender differently. However, differences in student ratings of the instructor were not distinguishable on the basis of gender. Both males and females provided high ratings for the lecture presentation. Second, the subject material may have been gender specific. In other words, the economics lecture may have represented more traditionally "masculine" content, thereby providing an advantage for male subjects. However, this is unlikely, given that the material presented was novel to both females and males. Students who had previously been exposed to the lecture material were removed from the study. Third, higher levels of test anxiety predict poorer learning outcomes (Hembree, 1988). Given that females tend to report higher levels of test anxiety, they may also be more predisposed to poorer achievement outcomes.

Test Anxiety

The test anxiety main effects confirm the initial hypothesis, and replicate and extend previous studies that high, as compared to low test anxiety predicts poorer learning outcomes (Prociuk & Breen, 1973). In the present study, high test-anxious students demonstrated poorer learning outcomes, felt less success and control over their performance outcomes and overall, felt more helpless than low test-anxious students. Once in the classroom, high test-anxious students' learning is characterized by reduced lecture achievement (Galassi, Frierson & Sharer, 1981). Further, students' perception of control is minimized (Rapaport, 1984). In turn, this perception can yield negative affects such as helplessness (Dweck & Wortman, 1982; Schwartzer, Jerusalem, & Stiksrud 1984). Helplessness in turn, is thought to further impair students' cognitions, affects, and behaviors (Abramson, Garber, & Seligman, 1980).

These results provide patterns that tend to show differences in learning orientation associated with test anxiety. As mentioned above, high test-anxious students tend to be

characterized by poorer learning and related outcomes. Their attention may be minimized, due to what researchers have labeled the interference model (Cullar & Holahan, 1980; Darke, 1988). These students are known to excessively ruminate about their failure and vulnerability (Beck & Emery, 1985; McKeachie, Pollie, & Spiesman, 1985; Sarason, 1984; Wine, 1971), and thus, may be distracted from critical learning requirements such as attending to the lecture. Disadvantaged because of the cognitive interference associated with high test anxiety, their less adaptive learning orientations "cripples" them academically. In contrast to high test-anxious students, low test-anxious students tend to be endowed with adaptive learning orientations, as exemplified by higher scholastic outcomes.

According to Domino (1975), anxiety has two sides to it: an "energizing source" and a "crippling obstacle" to scholastic achievement. As an "energizing source", low moderate levels of anxiety are facilitative, enhancing learning. However, too much anxiety, especially if the task at hand is highly self-relevant or ego-involving (Schwarzer, 1981), substantially reduces effective learning. In such cases, the task will be perceived as a challenge, a threat, or an event that causes loss of control (Lazarus & Launier, 1978). Repeated exposures of unexpected failure may increase a students' loss of control in a particular situation, causing increased levels of anxiety. In this case, higher levels of anxiety serve as a debilitating state or trait (Schwarzer, Jerusalem, & Stiksrud, 1984), "crippling" effective learning. The student no longer feels challenged, but rather, threatened, and experiences higher levels of anxiety, with repeated exposure resulting in depression and eventually, helplessness (Schwarzer et al., 1984).

Gender and Test Anxiety

Contrary to Hembree's (1988) findings, achievement differences as well as cognitions and affects, are predicted on the basis of gender by test anxiety interaction. More specifically, low test-anxious males show higher achievement outcomes, perceive more success over their performance, and feel more confident than high test-anxious males or females. This is expected, given that high test anxiety reflects a less-than-adaptive learning orientation. As mentioned previously, high levels of test anxiety may actually interfere with the learning process. High test-anxious students are unable to benefit from effective instruction, perform poorly, and as a result feel less successful about their performance and more helpless. Low test-anxiety, on the other hand, not only enhances learning from teaching environment, but also has an impact on student's perceptions of success and confidence. These in turn, impact students' future scholastic endeavours.

Rather disturbing though, is the fact that low-test anxious females do not fare as well as their male counterparts. In fact, low test-anxious females display poorer achievement scores and feel more helpless than low test-anxious males. This is surprising, especially since low levels of test anxiety are thought to be associated with adaptive learning orientations. A number of explanations may account for these findings. First, females may be distorting their level of test anxiety. Second, the gender of the instructor may threaten females as compared to males, and thus cause the inability to benefit from the instruction. Third, the economics lecture may be too closely related to mathematics and thus illicit a "mathematics anxiety" (Clute, 1984) that is not compensated for by the adaptive learning orientation thought to be associated with low test anxiety. Each of these explanations are at best speculative, requiring further investigation.

Research Implications

A number of research issues have been generated by the present thesis. First, research attempting to effectively and efficiently identify "at-risk" students may be of great help to educators. Such an emphasis might be accomplished through the development of an instrument that utilizes the fewest, most salient dimensions through which most "at-risk" students can be identified. These students, in turn, would be given the option of receiving remedial programs

designed to modify their less adaptive learning orientations. By doing so, the college setting may provide the means for their scholastic success. Second, an investigation as to why certain students, specifically the low test-anxious, are sometimes able to endure ineffective instruction and still maintain academic excellence may provide keys for modification programs for high test-anxious students.

Third, field studies are needed. The present thesis represents learning only in the classroom analog, an environment created to simulate the actual college classroom. Furthermore, students were exposed to a "one-time" lecture episode without the chance of studying for the test. Exposure to a one 30-minute effective lecture episode may not be enough to enhance the learning experience of students with less adaptive learning orientations. A better measure of the lecture manipulations would be to provide students with consistent lecture behaviors over the duration of a course. Also, a real classroom may provide students with the incentives to learn the material and thus increase the ego-involvement of students.

Educational Implications

Student differences, defined by gender and test anxiety, have important implications for student achievement and achievement related outcomes. In order to improve the quality of higher education for all students, researchers and educational practitioners need to focus on these differences. Of concern is the high test-anxious male and female student, who may be endowed with a less adaptive learning orientation. This phenomenon requires the concentrated effort of researchers and educators, focused on improving these students' learning orientations through remedial programs that may improve the quality of their learning experiences and thereby, transform the college learning environment to produce an equitable learning experience for all students. For instance, educators and researchers can learn from the low test-anxious students' strengths and attempt to transfer them to the maladaptive learners via remediation programs.

Remedial programs designed to modify students with maladaptive learning orientations should be made available to "at-risk" students. For instance, cognitive training involving the reduction of the debilitating aspects (i.e., worry) of test anxiety in a testing situation has resulted in high test-anxious students achieving as well as their low test-anxious counterparts (Wine, 1982). Thus, scholastic improvement may be facilitated by specific cognitive strategies that modify students' less adaptive learning orientations to more adaptive ones.

Finally, readers are cautioned when applying these results directly to the college classroom for the following reasons. First, learning occurred in a simulated, not actual college classroom. Second, students were exposed to a "one-time" lecture episode, and tested immediately without the chance of studying for the test or seeking additional help or resources. Third, video-taped lecture, as compared to live teaching, was used to present the stimulus material. Finally, novel lecture material was presented in order to control for any extraneous variables influencing student learning, such as previous knowledge. Thus, the limitations of the study would suggest that the results be used with caution.

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Table 1.

Correlation Coefficients, Means, and Standard Deviations

Variables	1.	2.	3.	4.	5.	6.	7.
1. Gender							
2. Test Anxiety	-.244*						
3. Achievement	.112	-.209*					
4. Perceived learned	-.200*	.084	.112				
5. Perceived Success	.140	-.200*	.363**	.226*			
6. Perceived Control	.096	-.223	.195*	.200*	.461**		
7. Helpless-Confident	.082	-.233*	.168	.125	.459**	.407*	
Means	1.38	19.54	27.71	4.69	5.54	6.13	4.63
Standard Deviations	0.49	8.64	7.34	2.38	1.99	2.38	1.97

Note: Gender: Females = 1; Males = 2; * = $p > .05$; ** = $p < .01$.

Table 2

Means and Standard Deviations of Achievement Outcomes

	FEMALES		MALES	
	LOW TEST ANXIOUS	HIGH TEST ANXIOUS	LOW TEST ANXIOUS	HIGH TEST ANXIOUS
Achievement Test*1				
MEAN	15.32	15.49	18.33	15.19
STD	4.61	4.01	5.5	5.1
Perceived Success*2				
MEAN	5.45	5.24	6.37	4.89
STD	2.14	1.9	1.75	1.84
Perceived Control*3				
MEAN	6.08	5.84	6.87	5.54
STD	2.28	2.35	2.4	2.48
Helpless-Confident*4				
MEAN	4.78	4.84	3.84	5.41
STD	2.12	1.89	1.82	1.91
n	65	106	67	37

Note: *1 Achievement test based on lecture content (total = 30). *2"How successful did you feel at the end of the tests?" (1 = "not at all successful"; 10 = "extremely successful"). *3"How much control did you have over your performance on these tests?" (1 = "very little control"; 10 = "completely under my control"). *4"Rate the extent to which you experienced each of the following feelings as a reaction to the achievement tests" (i.e., 1 = "helpless"; 10 = "confident").

Table 3.

Gender (female, male) x Test Anxiety (low, high) 2 x 2 ANOVA Summary Table

Dependent Variables	Effect Level	MS_e	F	p
Achievement Test	Gender	22.07	8.80	.001
	Test Anxiety		10.15	.001
	Interaction		3.94	.05
Perceived Success	Gender	3.67	1.35	.24
	Test Anxiety		11.72	.0001
	Interaction		6.49	.01
Perceived Control	Gender	5.59	0.64	.43
	Test Anxiety		6.52	.01
	Interaction		3.15	.07
Helplessness-Confidence	Gender	3.73	0.58	.44
	Test Anxiety		10.56	.001
	Interaction		9.21	.001

Note: F (1, 274).

Instructors are exposed to students with diverse individual differences. Common among college students are their test anxiety differences that are predictive of their scholastic outcomes.

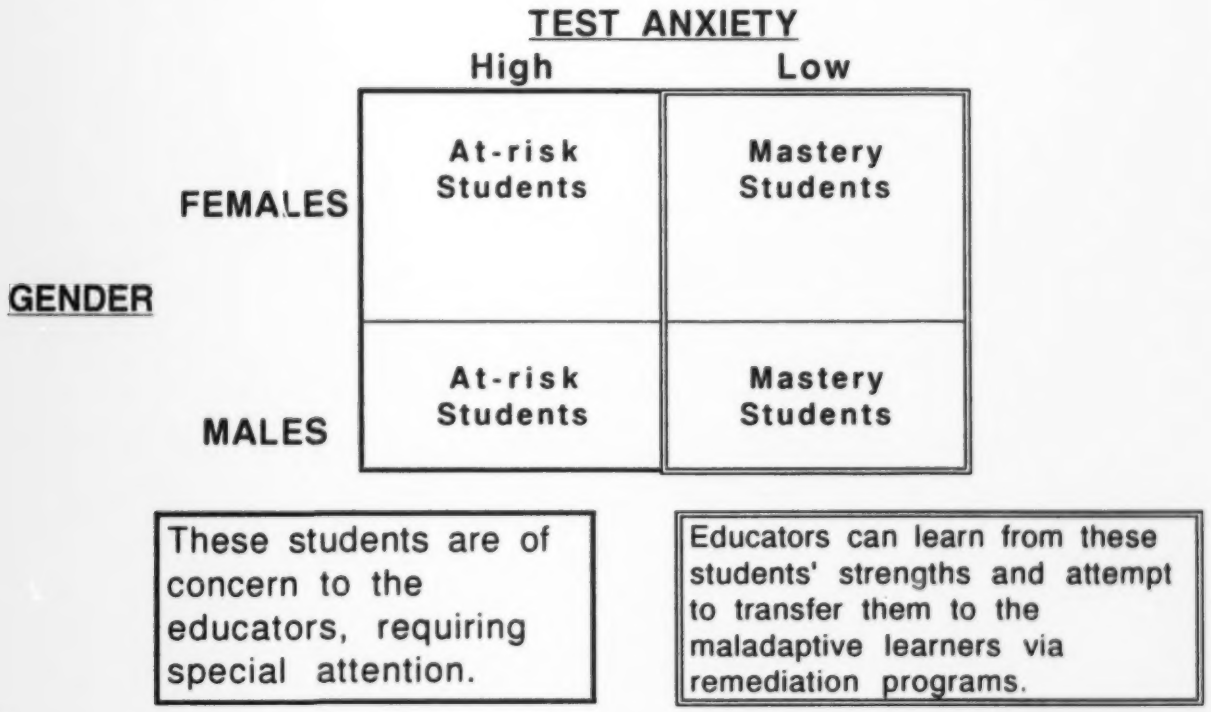

Figure 1. An example of the diversity of student differences that college instructors are exposed to.

Figure 2. Gender by Test Anxiety Interaction on Achievement

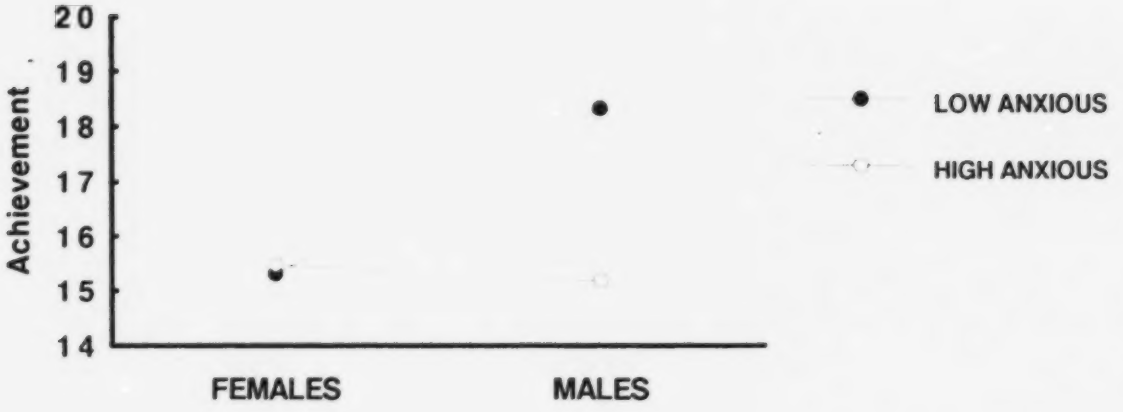

Figure 3. Gender x Test Anxiety Interaction on Perceived Success

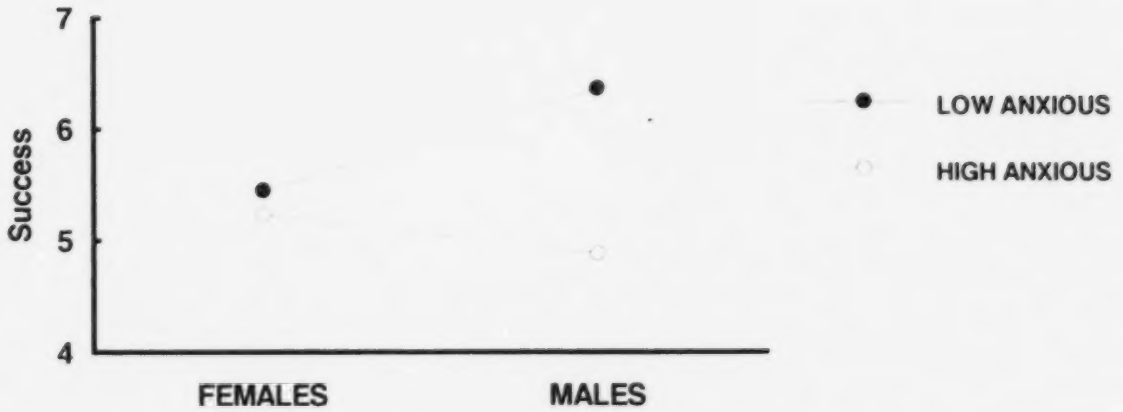

Figure 4. Gender by Test Anxiety Interaction on Helpless-Confidence